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LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
HOLLWEG, THOMAS A	

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2879	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/573,518	SONG ET AL.	
	Examiner	Art Unit	
	Thomas A. Hollweg	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 June 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19 and 21-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19 and 21-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 29, 2009, has been entered.

2. Applicant's Supplemental Amendment of June 22, 2009, is acknowledged. No claims are added or canceled. Claims 1-19 and 21-24 are currently pending.

3. Amendments to the claims correcting minor informalities are acknowledged. Previous objections to the claims are withdrawn.

4. Amendments to claim 15 are acknowledged, obviating the 35 U.S.C. § 112 rejections.

EXAMINER'S AMENDMENT

5. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

6. Authorization for this examiner's amendment was given in a telephone interview with Keith S. Van Duyne on July 31, 2009.

7. The following amendments are to the current version of the claims submitted in Applicant's Supplemental Amendment of Jun 22, 2009.

8. Claim 1, a strikethrough of deleted text was omitted for the words "surrounding the field emitter." The clause beginning with the words "a field emission-inducing gate portion," now reads "a field emission-inducing gate portion formed on top of the field emission-suppressing gate portion ~~surrounding the field emitter~~ having a metal mesh with at least one penetrating hold that surrounds electrons being emitted from the field emitter, and a dielectric layer surrounding the side of the metal mesh in the penetrating hole ~~formed on at least a part of the metal mesh~~,"

9. Claim 3, the word "wherein" was omitted after the words "claim 1." Claim 3 now reads "The field emission device according to claim 1, wherein a largest cross-section of the penetrating hole of the field emission-inducing gate portion is not greater than one time to three times a thickness sum of the metal mesh and the dielectric layer."

10. Claim 11, the previously deleted and strikethrough text "~~in [[the]] an~~" should have been omitted and is now removed.

11. Claim 15, the previously deleted and strikethrough text "~~[[a]] the~~" should have been omitted and is now removed.

Claim Objections

12. The following claims are objected to because of the following informalities:

a. Claim 11, "the penetrating hole of the metal mesh on top of the field emission-inducing gate portion" lacks antecedent basis. Claim 1, from which claim 11 is dependent only has a penetrating hole in the metal mesh. For

examination it is assumed that this phrase intends the upper-most portion of the penetrating hole in the metal mesh.

b. Claim 11, "the field emission-suppressing gate portion opening" lacks antecedent basis.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims 1, 2, 4-6, 8, 9, 12-18, 21, 22 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Janning, U.S. Patent No. 5,955,833.

15. **With regard to claim 1,** in figure 2, Janning discloses a field emission device (10') comprising: a cathode portion having a substrate (30'), a cathode electrode (22') formed on the substrate (30'), and a field emitter (12') connected to the cathode electrode (22'); a field emission-suppressing gate portion (26') formed on the cathode portion around the field emitter (12') and surrounding the field emitter (12'); and a field emission-inducing gate portion (26a) formed on top of the field emission-suppressing gate portion (26') having a metal mesh (26a) with at least one penetrating hole (28a) that surrounds electrons (29') being emitted from the field emitter (12'), and a dielectric layer (40a) surrounding the side of the metal mesh (26a) in the penetrating hole (28a), wherein the field emission-suppressing gate portion (26') suppresses electrons from

being emitted from the field emitter (12'), and the field emission-inducing gate portion (26a) induces electrons to be emitted from the field emitter (12') (col. 5, line 3 - col. 6, line 11).

16. **With regard to claim 2,** in figure 2, Janning discloses that the dielectric layer (40a) of the field emission-inducing gate portion (26a) is formed on an entire surface or a portion of the surface of the metal mesh (26a) (col. 5, lines 56-64).

17. **With regard to claim 4,** in figure 2, Janning discloses that the penetrating hole (28a) of the metal mesh (26a) has at least one inclined inner wall (col. 5, line 64-66).

18. **With regard to claim 5,** in figure 2, Janning discloses that the dielectric layer (40a) covers the inclined inner wall of the penetrating hole (28a) (col. 5, lines 60-61).

19. **With regard to claim 6,** in figure 2, Janning discloses that the field emission-suppressing gate portion (26') is electrically insulated (24a) from the field emission-inducing gate portion (26a), and has an insulator (24') with a field emission-suppressing gate opening (28') therein, and a field emission-inducing gate electrode (26') formed on the insulator (24') (col. 5, lines 19-22).

20. **With regard to claim 8,** in figure 2, Janning discloses that the inner wall of the metal mesh (26a) includes a protrusion having at least two inclined angles (one on either side of the hole; col. 5, lines 56-64).

21. **With regard to claim 9,** in figure 2, Janning discloses that the metal mesh (26a) of the field emission-inducing gate portion (26) is a metal plate formed of one of aluminum, iron, copper and nickel, or an alloy plate containing at least one of stainless steel, invar and kovar (col. 5, lines 42-45; col. 5, lines 64-66).

22. **With regard to claim 12,** in figure 2, Janning discloses that the field emitter (12') is formed of a thin or thick film formed of one of diamond, diamond like carbon, carbon nanotube, and carbon nanofiber (col. 3, lines 36-40).

23. **With regard to claim 13,** the examiner notes that the claim limitation "the filed emitter is formed by directly growing any one of diamond, diamond like carbon, carbon nanotube, and carbon nanofiber on the cathode electrode using a catalytic metal" is drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation has been considered but is not patentably distinct over Janning (See MPEP 21113).

24. **With regard to claim 14,** the examiner notes that the claim limitation "the field emitter is formed by printing a paste containing any one of powder type diamond, diamond like carbon, carbon nanotube and carbon nanofiber" is drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation has been considered but is not patentably distinct over Janning (See MPEP 21113).

25. **With regard to claim 15,** in figure 2, Janning discloses a field emission display device (10') comprising: a cathode portion including cathode electrodes (22') and field emission-suppressing gate electrodes (26') arranged in a stripe form (col. 5, lines 14-

15) to allow matrix addressing to be carried out and insulated (24') from each other on a substrate (30'), and pixels defined by the cathode electrodes, and wherein each pixel having a field emitter (12') connected to the cathode electrode (22'); a field emission-suppressing gate portion (26') having an insulator (24') with a gate opening in a field emission-suppressing gate of the cathode portion formed on a region around the field emitter (12') in the form of surrounding the field emitter (12') that surrounds electrons (29') being emitted from the field emitter (12'); a field emission-inducing gate portion (26a) having a metal mesh (26a) and formed on top of the field emission suppressing gate portion (26') with at least one penetrating hole (28a) allowing electrons (29') emitted from the field emitter (12') to pass therethrough, and a dielectric layer (40a) surrounding the side of the metal mesh (26a) in the penetrating hole (28a); and an anode portion having an anode electrode (16') and a phosphor (18') connected to the anode electrode (16'), wherein the field emission-suppressing gate portion (26') suppresses electrons (29') from being emitted from the field emitter (12'), and the field emission-inducing gate portion (26a) induces electrons (29') to be emitted from the field emitter (12') so that the electrons (29') emitted from the field emitter (12') collide with the phosphor (18') via the penetrating hole (28a) (col. 5, line 3 - col. 6, line 11).

26. **With regard to claim 16,** in figure 2, Janning discloses that the cathode portion, the field emission-suppressing gate portion (26'), the field emission-inducing gate portion (26a), and the anode portion are vacuum-packaged such that the field emitter (12') of the cathode portion is opposed to the anode electrode (16') of the anode portion

via a field emission-suppressing gate opening (28') and the penetrating hole (28a) (col. 4, lines 56-66; col. 5, lines 56-64).

27. **With regard to claim 17,** examiner notes that the claim limitation "a constant direct current voltage is applied to the field emission-inducing gate portion to induce electron emission from the field emitter of the cathode portion, and a scan signal having a negative voltage is input to the field emission-suppressing gate portion and a data signal having a positive or negative voltage is input to the cathode portion to display an image" is drawn to a method of operating the claimed field emission display and does not further limit the structure of the device explicitly. The claim limitation has been considered, however, absent a showing that the structure of the device is further limited, this method of operation limitation cannot distinguish the claimed device over the Janning (see MPEP 2114).

28. **With regard to claim 18,** examiner notes that the claim limitation "a pulse amplitude or a pulse width of the data signal is modulated to represent a gray scale" is drawn to a method of operating the claimed field emission display and does not further limit the structure of the device explicitly. The claim limitation has been considered, however, absent a showing that the structure of the device is further limited, this method of operation limitation cannot distinguish the claimed device over the Janning (see MPEP 2114).

29. **With regard to claim 21,** in figure 2, Janning discloses that the cathode portion, the field emission-suppressing gate portion (26'), and the field emission-inducing gate

portion (26a) are opposed to the anode portion using a spacer (20') as a support (col. 4, line 64).

30. **With regard to claim 22,** in figure 2, Janning discloses that the dielectric layer (40a) is formed on an entire surface or a part of the surface of the metal mesh (26a) (col. 5, lines 6—61).

31. **With regard to claim 24,** in figure 2, Janning disclose that the penetrating hole (28a) of the metal mesh (26a) has at least one inclined inner wall (col. 5, lines 56-64).

Claim Rejections - 35 USC § 103

32. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

33. Claims 3, 7 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Janning as applied to claims 1, 6 and 15 above, in view of itself.

34. **With regard to claim 3,** Janning discloses all of the limitations, except it does not expressly disclose the dimensions of the holes or the thicknesses of the various electrode and insulating layers.

35. One having ordinary skill in the art would understand that the field emission device disclosed by Janning operates based on the electrical fields generated between the various electrodes, and the effectiveness of these fields to create an image is related to the physical dimensions of the electrodes and surrounding layers, including

thicknesses of the layers, shape of the electrodes and dimensions of the holes through which the electrons travel. It has been held that where the general limitations of the claim are taught by the prior art, discovering an optimum or workable range involves only routine skill in the art (*In re Aller*, 105 USPQ 233 (CCPA 1955)).

36. Therefore, at the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Janning field emission device where the dimensions of the electrodes and insulators are optimal, such that a largest cross-section of the penetrating hole of the field emission-inducing gate portion is not greater than one time to three times a thickness sum of the metal mesh and the dielectric layer.

37. **With regard to claim 7,** Janning discloses all of the limitations, except it does not expressly disclose the dimensions of the holes or the thicknesses of the various electrode and insulating layers.

38. One having ordinary skill in the art would understand that the field emission device disclosed by Janning operates based on the electrical fields generated between the various electrodes, and the effectiveness of these fields to create an image is related to the physical dimensions of the electrodes and surrounding layers, including thicknesses of the layers, shape of the electrodes and dimensions of the holes through which the electrons travel. It has been held that where the general limitations of the claim are taught by the prior art, discovering an optimum or workable range involves only routine skill in the art (*In re Aller*, 105 USPQ 233 (CCPA 1955)).

39. Therefore, at the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Janning field emission device where the

dimensions of the electrodes and insulators are optimal, such that a largest cross-section of the field emission-suppressing gate opening is one time to twenty times a thickness of the insulator.

40. **With regard to claim 23,** Janning discloses all of the limitations, except it does not expressly disclose the dimensions of the holes or the thicknesses of the various electrode and insulating layers.

41. One having ordinary skill in the art would understand that the field emission device disclosed by Janning operates based on the electrical fields generated between the various electrodes, and the effectiveness of these fields to create an image is related to the physical dimensions of the electrodes and surrounding layers, including thicknesses of the layers, shape of the electrodes and dimensions of the holes through which the electrons travel. It has been held that where the general limitations of the claim are taught by the prior art, discovering an optimum or workable range involves only routine skill in the art (*In re Aller*, 105 USPQ 233 (CCPA 1955)).

42. Therefore, at the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Janning field emission device where the dimensions of the electrodes and insulators are optimal, such that a largest cross-section of the field emission-suppressing gate is equal to or smaller than one time to twenty times a thickness of the insulator layer.

43. Claims 10 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Janning as applied to claims 1 and 15 above, in view of Ge, U.S. Patent Application Publication No. 2002/0000771 A1.

44. **With regard to claim 10,** Janning discloses all of the limitations, however it does not expressly disclose that the field emission-suppressing gate portion is divided into a plurality of openings, wherein the penetrating hole of the field emission-inducing gate portion is one per unit pixel.

45. Ge, in figure 5, teaches a field emission device (250) where the field emission-suppressing gate portion (252) is divided into a plurality of openings, wherein the penetrating hole of the field emission-inducing gate portion (252) is one per unit pixel [0018, 0030].

46. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Janning device where that the field emission-suppressing gate portion is divided into a plurality of openings, wherein the penetrating hole of the field emission-inducing gate portion is one per unit pixel, as taught by Ge, to allow for a display with a finer pitch.

47. **With regard to claim 19,** in figure 2, Janning discloses that the anode portion is composed of a transparent substrate (14'), transparent electrodes (16') formed on the transparent substrate (14'), and phosphors (18') (col. 4, lines 56-64) that may be individually addressed (col. 3, lines 64-67).

48. Janning does not expressly disclose that the phosphors are red (R), green (G) and blue (B) colors formed on a predetermined region of each transparent electrode, and a black matrix formed between the phosphors.

49. Ge, in figure 4, discloses a field emission device having an anode portion composed of a transparent substrate (12), transparent electrodes (32) formed on the

transparent substrate (12), and phosphors of red (R), green (G) and blue (B) colors (33) formed on a predetermined region of each transparent electrode (32), and a black matrix formed between the phosphors (33) [0021-0022] so the device may operate as a high contrast full color display for displaying desired images [0009-0010].

50. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Janning field emission device where phosphors of red (R), green (G) and blue (B) colors are formed on a predetermined region of each transparent electrode, and a black matrix is formed between the phosphors so the device may operate as a high contrast full color display for displaying desired images, as taught by Ge.

51. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Janning as applied to claim 1 above, in view of Okamoto, U.S. Patent No. 5,850,120.

52. **With regard to claim 11,** Janning discloses all of the limitations except it does not expressly disclose that a size of the penetrating hole of the metal mesh on top of the field emission-inducing gate portion is larger than that in the field emission-suppressing gate portion opening.

53. Okamoto, in figure 9, teaches a field emission device where a size of the penetrating hole of the metal mesh on top of the field emission-inducing gate portion (33) is larger than that in the field emission-suppressing gate portion (32) opening (col. 10, lines 40-65).

54. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Janning device where that a size of the penetrating hole of the metal mesh on top of the field emission-inducing gate portion is larger than that in the field emission-suppressing gate portion opening, as taught by Okamoto, so that the electrons from several emitters can be accelerated toward the anode by the potential of a single field emission-inducing gate, simplifying design.

Response to Arguments

55. Applicant argues that the prior art of record, Janning, does not disclose a dielectric layer surrounding the side of the metal mesh in the penetrating hole. Janning, figure 2, clearly shows the dielectric layer (40a) surrounding the side of the metal mesh (26a) in the penetrating hole (28a).

56. Applicant further argues that the prior art of record, Janning, does not disclose the limitation, wherein the field emitter is formed of a thin or thick film formed of one of diamond, diamond like carbon, carbon nanotube, and carbon nanofiber. Janning, col. 3, line 38, states that one type of emitter is a thin film amorphic diamond emitter. The argument that Janning teaches away from a thin or thick film design is unsupported. The fact that Janning describes a typical or preferred emitter as a miniature electron gun does not amount to a teaching away, when in the preceding paragraph Janning describes a thin film emitter as one of a “variety of designs” (col. 3, lines 36-37).

57. The examiner acknowledges that the figures and the Description of the Preferred Embodiment of contain cone shaped Spindt tip emitters. However the Janning invention is for a novel electron amplification enhancement layer applied to the grid electrodes,

which is independent from the type of emitters employed. Nothing in Janning supports a teaching away from the use of film emitters which is disclosed as one of several design options (col. 3, lines 36-37).

58. For these reasons, applicant's arguments are not found to be persuasive.

Conclusion

59. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas A. Hollweg whose telephone number is (571) 270-1739. The examiner can normally be reached on Monday through Friday 7:30am-5:00pm E.S.T..

60. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

61. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TH/

/NIMESHKUMAR D. PATEL/
Supervisory Patent Examiner, Art Unit 2879